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ABSTRACT

This annual report begins with a brief overview of the network of research and development centers, educational laboratories, and ERIC facilities in the United States. The second section outlines the organizational structure and main focus of the Wisconsin Research and Development Center for Cognitive Learning. The third section reviews the activities and accomplishments of the various projects at the center, and the last section summarizes its future plans. Appendixes present governing and advisory group membership, staff resumes, and a 232-item bibliography. (RA)

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SIXTH ANNUAL REPORT

Academic Year 1969-70

Wisconsin Research and Development Center for Cognitive Learning

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Herbert J. Klausmeier,
Director

August 1 1970

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The National Program of Educational Research and Development Centers

NATIONAL PROGRAM OF EDUCATIONAL RESEARCH AND DEVELOPMENT CENTERS

This Center is one of a system of eight Educational Research and Development Centers funded under the Cooperative Research Act (as amended by Title IV of the Elementary and Secondary Education Act of 1965). The program was organized as one response to an increased national awareness of the importance of finding solutions to critical educational problems.

More specifically, the R&D Centers program was devised to fill a unique role in relation to other forms of educational research and development by providing a prime avenue for (a) bringing together a critical mass of interdisciplinary talent and other research resources from the behavioral sciences and other disciplines, (b) focusing on a crucial educational problem area by means of a long-range coordinated attack on large-scale problems, and (c) moving promising innovations through development toward an impact on actual educational practice. Although R&D Centers generally do not carry the innovative process through to final implementation themselves, they are charged with the responsibility for projecting a further route toward that goal by enlisting the interest of a regional educational laboratory, commercial developer, state or local agency, coordinating body, or other appropriate institution.

This annual report describes some of the recent accomplishments of one of these centers in its progress toward meaningful educational change. The complete list of eight R&D Centers and year in which they were funded follows:

Learning Research and Development Center, University of Pittsburgh (1964)

Center for the Advanced Study of Educational Administration, University of Oregon (1964)

Wisconsin Research and Development Center for Cognitive Learning, The University of Wisconsin (1964)

Center for the Study of Social Organization of Schools, The Johns Hopkins University (1966)

Research and Development Center for Teacher Education, University of Texas at Austin (1965)

Stanford Center for Research and Development in Teaching, Stanford University (1965)

Center for Research and Development in Higher Education, University of California at Berkeley (1965)

Center for the Study of Evaluation, University of California at Los Angeles (1966)

Also funded through this same program is the National Program on Early Childhood Education, which consists of seven university-based centers whose research and development efforts are coordinated through the Central Midwestern Regional Education Laboratory (CEMREL), St. Ann, Missouri.

The Educational Research and Development Centers are part of a larger set of institutions which contribute in specialized ways to the improvement of educational practice. These include:

° The two Educational Policy Research Centers, charged with providing a continuing examination of future educational needs and resources for the years 1980-2000.

° The two Vocational Education Research Centers, established under the provision of the Vocation Education Act of 1963.

° The system of 15 Regional Educational Laboratories, each of which concentrates on specific problems concerned with the development, demonstration, and dissemination of educational alternatives, materials, and practices for the schools; some of these have close relationships with the Educational Research and Development Centers.

° The Educational Resources Information Center (ERIC), a nationwide network for acquiring, selecting, abstracting, indexing, storing, retrieving, and disseminating information about educational research and resources, including 20 ERIC Clearinghouses, each providing coverage of a particular educational area.

REGIONAL LABORATORIES AND R & D CENTERS CURRENTLY IN OPERATION

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Center Administration and Programs

CENTER ADMINISTRATION AND PROGRAMS

RÉSUMÉ

Since its founding in September 1964 the objective of the Wisconsin Research and Development Center for Cognitive Learning has been to improve educational practices through programmatic research and development. Development efforts are directed toward building a self-renewing system of Individually Guided Education in the Multiunit Elementary School. Research is directed toward understanding cognitive learning in children and related instructional processes; results are applied to developing a system of Individually Guided Education.

The Center's role in developing curriculum materials and procedures and in generating knowledge about learning and instruction is implemented through two programs and Technical, Dissemination, and Business Sections. The staff is an interdisciplinary one, including psychologists, sociologists, linguists, teachers, curriculum specialists, and subject matter scholars in reading and other language arts, science, mathematics, and social studies. This insures that instructional programs have a sound knowledge base and that the results of research are applied to the improvement of educational practice.

ORGANIZATIONAL STRUCTURE

Administratively, the Center is located in the University's School of Education as shown in Figure 1. It draws upon the University for part of its staff and many other resources. Professors from various departments of the University are principal investigators in the Center.

The Center is administered by a Center director responsible for formulating and evaluating the total Center program and its broad research, development, and dissemination strategies. He is also responsible for employing principal investigators, section directors, and other Center administrators. Other responsibilities include securing and allocating funds and reporting to relevant persons and agencies. An associate director assists the director in planning and evaluating Center programs. Directors of the Technical, Dissemination, and Operations and Business Sections are responsible for the management and coordination of Center activities. Research and development activities of the Center are directed by a faculty of principal investigators; members have rank in an instructional department of the University and hold a joint appointment in the Center.

Governing Groups

Three groups comprise the governing bodies of the Center: the University Policy Review Board, the Executive Committee, and the Management Council. The University Policy Review Board brings the necessary University resources to bear upon the problems which the Center is interested in solving. The Center's Executive Committee meets monthly and acts upon recommendations made by the Center director regarding policies, programs, personnel, business and operations, and budget. The Management Council manages

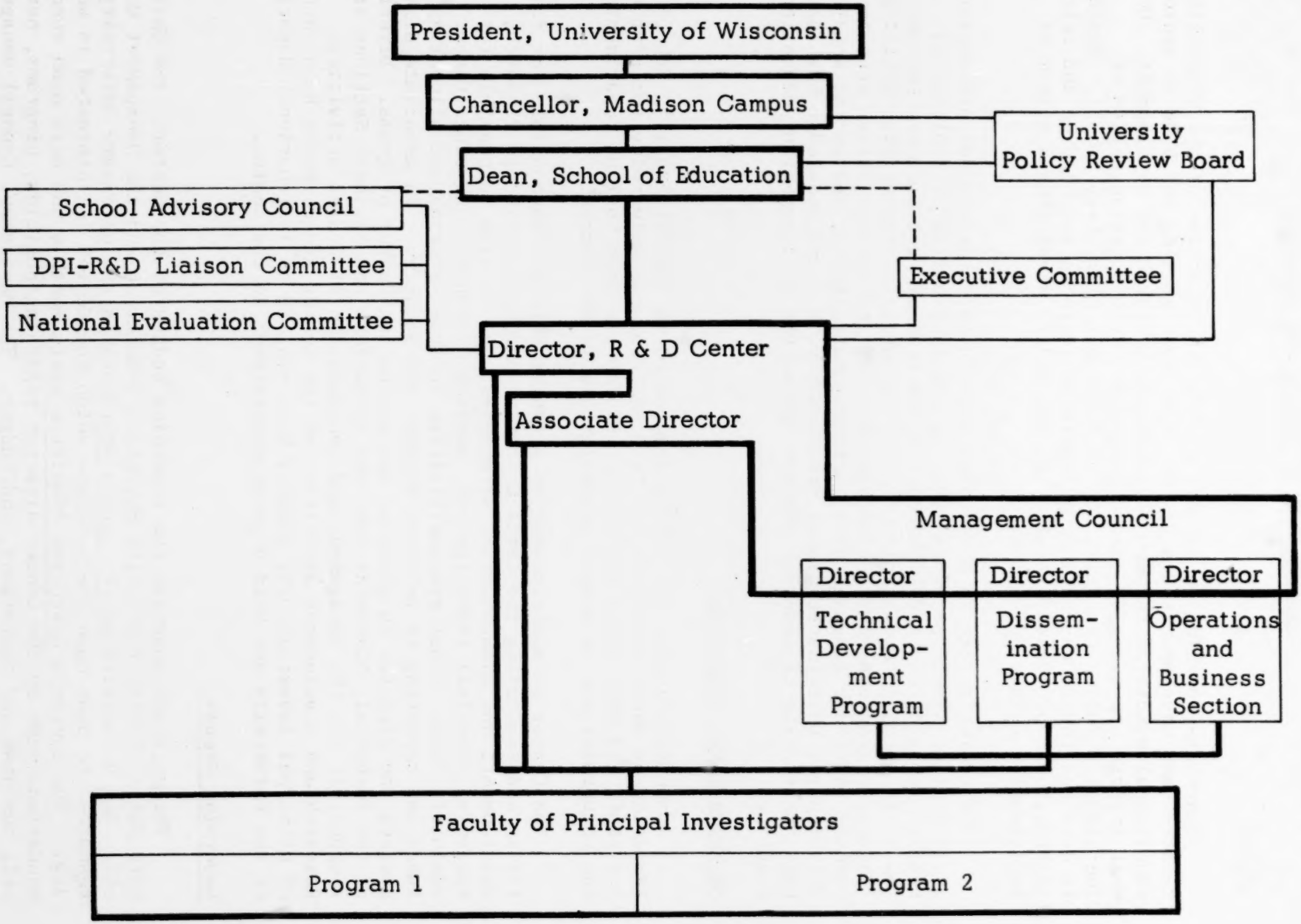

Figure 1: WISCONSIN R & D CENTER ORGANIZATIONAL CHART

the internal affairs of the Center and assures smooth functioning of activities related to research and development, disseminating and reporting, and business and operations.

Advisory Groups

Two advisory groups are the National Evaluation Committee and the School Advisory Council. The National Evaluation Committee confers annually regarding the Center's programs and progress. This group is comprised of nationally known researchers, educational practitioners, and public leaders. The School Advisory Council consists of representatives of local schools and educational agencies. The Council receives information and reports from the Center and consults with the Center director, the Center staff, and University of Wisconsin personnel.

During the past year three ad hoc task forces assisted the Center in preparing its long-range plans. Constituted of personnel from the Center and other departments of the University, there were the Science-Social Studies Task Force, the Reading and Related Language Arts Task Force, and the Task Force on Individually Guided Education. Outcomes of the task force deliberations were a needs and specifications statement for an elementary instructional program in ecology, a recommendation for combining all of the reading-related activities of the Center, and recommendations for involving even more elements of the University in the Center's efforts to build a self-renewing system of Individually Guided Education.

Because the Center's outputs have become ready for widespread school use and the Center is broadening its dissemination efforts, the Dissemination Advisory Committee has been established. It is comprised of personnel from within and outside the University competent in a number of areas in which the Center's dissemination program is involved.

Policies and Procedures

Policies of the Center are formulated by the director with the assistance of the Management Council and acted upon by the Executive Committee. Procedures for implementing policy are developed and coordinated by the Management Council and outlined in the Center Handbook.

Facilities

When the Center was founded in 1964, some of the staff were housed in the antiquated Education Building. The next location was an empty grocery store leased and partially remodeled by the University. In February 1966, the University leased facilities which presently provide offices for the whole Center staff. There are a few work areas but no research laboratories. In 1967 the University received an invitation from the Office of Education to submit a request for facility and special equipment funds. The next spring a planning grant was awarded the University to assist in developing specifications. In June 1969 construction and special equipment funds were awarded. The new building has been designed and bidding has been completed. Groundbreaking and construction will begin in the early fall of 1970.

RELATIONSHIPS WITH OTHER INSTITUTIONS

Relationships have been established with a number of institutions and agencies. These have been established as part of the Center's strategy to extend to the classroom improved practices, programs, and procedures arising out of its research and development efforts. Thus, some relationships have been established for demonstrating Center outputs, for large-scale field testing and installation, for the national distribution of Center products, for further research and development outside the Center's focus and objectives, and for improving teacher education programs. Among the participating institutions and agencies:

1. Four elementary schools in Racine, Madison, and Janesville, Wisconsin, designated as developmental schools in which the Center conducts most of its research and development activities and which demonstrate many Center outputs.

2. The Wisconsin Department of Public Instruction as the central agency in a statewide demonstration and implementation model which involves sixteen teacher education institutions, and 104 elementary schools in the PACT (Participation to Activate Change Today) Network.

3. The University of Wisconsin School of Education for relating Center outputs to teacher education practices and programs. Its model elementary teacher education program was funded with a second-phase federal planning grant.

4. The National Instructional Television Center in Bloomington, Indiana, as the national distributor of Patterns in Arithmetic.

5. The Northwest Regional Educational Laboratory in Portland, Oregon, for the field testing and installing of Patterns in Arithmetic in small schools.

6. The Institute for the Development of Educational Activities (/I/D/E/A/), educational arm of the Kettering Foundation, for the production of an inservice and preservice education program of materials and activities to be used in the dissemination of concepts and practices pertaining to the Multiunit Elementary School organization.

7. The University of Toledo in Ohio, which is demonstrating the Multiunit Elementary School in Ohio, and which has incorporated the new organizational design in its proposed model elementary teacher education project that has been funded with two federal planning grants.

8. The College of Education of the State University of New York at Fredonia, which is adapting Individually Guided Education in the Multiunit Elementary School as part of the activities of its Teacher Education Research Center.

9. The Center for the Advanced Study of Educational Administration at the University of Oregon at Eugene, which is conducting a longitudinal study of the administrative and organizational characteristics, including differentiated instructional roles, of the Multiunit Elementary School.

10. The Southeastern Education Laboratory for the field testing of the Wisconsin Design for Reading Skill Development in Florida, Georgia, and Alabama.

11. The Jefferson County School District, Colorado, for the field testing of the Wisconsin Design for Reading Skill Development in 31 elementary schools.

12. National Computer Systems, Minneapolis, Minnesota, which is providing production of related materials and the machine scoring for the field testing of the Wisconsin Design for Reading Skill Development.

13. William W. Matthews & Co., Pittsburgh, Pennsylvania, for the production and distribution of the Center's introductory film, Individually Guided Education for All Children.

14. Dembar Educational Research Services, Inc., Madison, Wisconsin, for the production and distribution of a Center book, Research and Development Toward the Improvement of Education.

15. Academic Press for the production and distribution of Analysis of Concept Learning.

PROGRAMS

The Center's objective is differentiated into two programs, and the specific research and development activities are divided among projects within each program as shown in Table 1.

For Program 1, Conditions and Processes of Learning, the objectives are to generate new knowledge about concept learning and cognitive skills; to synthesize existing knowledge and develop general taxonomies, models, or theories of cognitive learning; and to utilize the knowledge in the development of curriculum materials and procedures. Projects in this program are focusing their research and development efforts on concept learning, motivation and retention, creative problem solving, perception, pre-reading skills, and peer teaching techniques.

The objective of Program 2, Processes and Programs of Instruction, is to develop curriculum materials and instructional procedures which implement Individually Guided Education for elementary and preschool children. Materials and procedures are then tested and refined. To accomplish this, sequences of concepts and cognitive skills within and across subject matter areas are identified and knowledge about instructional procedures is generated. Projects in Program 2 are currently focusing on reading, mathematics, and

TABLE I

Program and Project Register

(Academic Year 1969-1970)

Wisconsin Research and Development Center
for
Cognitive Learning

Code Number	Title	Investigator
01	CONDITIONS AND PROCESSES OF LEARNING	
0101	Situational Variables and Efficiency of Concept Learning	H. J. Klausmeier R. Davidson P. Wolff J. Levin
0102	Motivation and Individual Differences in Learning and Retention	F. H. Farley
0103	Task and Training Variables in Human Problem Solving and Creative Thinking	G. A. Davis
0104	Basic Pre-Reading Skills: Identification and Improvement	R. L. Venezky L. Wilder
0107	Role Theory Analysis of Peer-Teaching Techniques	V. L. Allen
0111	A Structure of Concept Attainment Abilities	R. Davidson L. S. Golub H. J. Klausmeier T. A. Romberg R. Tabachnick A. Voelker
02	PROCESSES AND PROGRAMS OF INSTRUCTION	
0201	Individually Guided Elementary Mathematics	T. A. Romberg J. G. Harvey M. V. DeVault
0203	Prototypic Instructional Systems: Elementary Science	M. O. Pella A. Voelker
0204	Reading and Related Language Arts	W. Otto L. S. Golub
0207	Preparing Personnel for Differentiated Instructional Roles	R. Tabachnick D. Lange T. Czajkowski

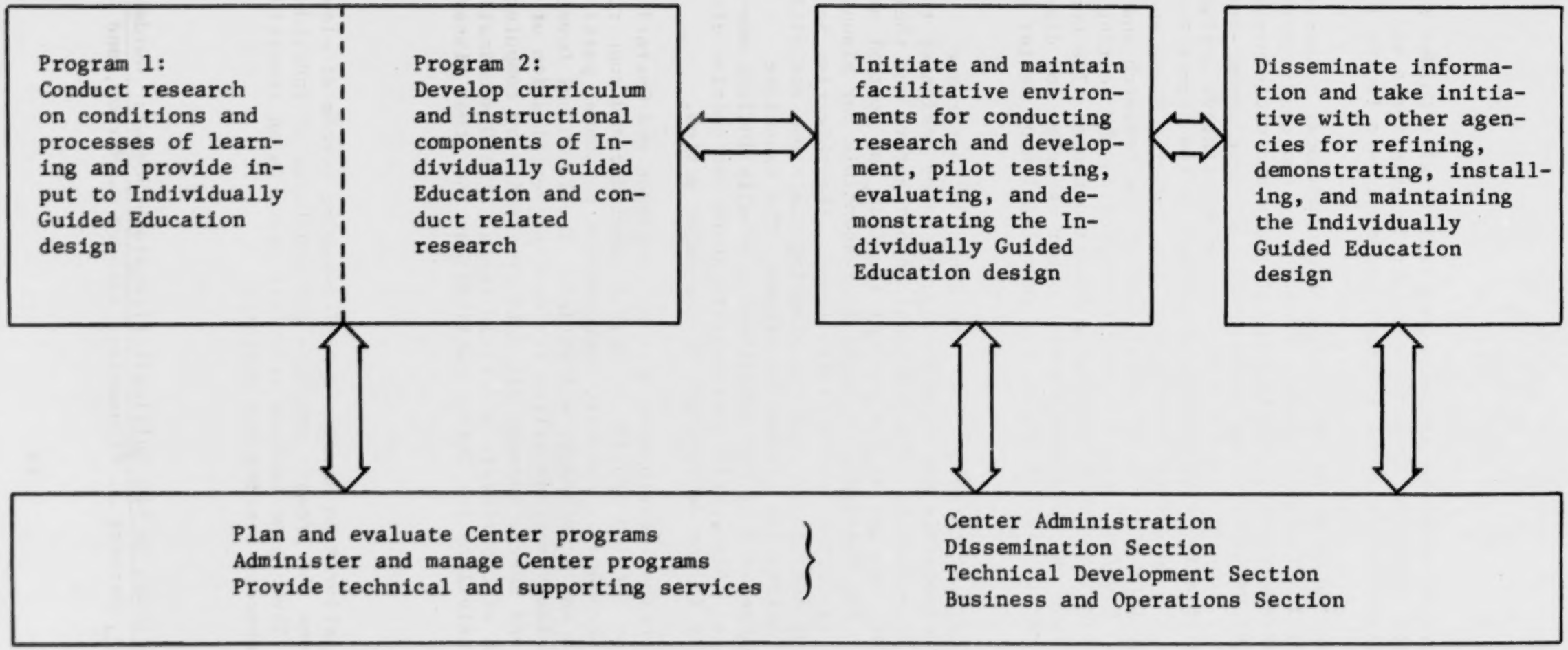
Program 1:
Conduct research on conditions and processes of learning and provide input to Individually Guided Education design
Program 2:
Develop curriculum and instructional components of Individually Guided Education and conduct related research
Initiate and maintain facilitative environments for conducting research and development, pilot testing, evaluating, and demonstrating the Individually Guided Education design
Disseminate information and take initiative with other agencies for refining, demonstrating, installing, and maintaining the Individually Guided Education design
Plan and evaluate Center programs
Administer and manage Center programs
Provide technical and supporting services
Center Administration
Dissemination Section
Technical Development Section
Business and Operations Section

Figure 2: MAJOR FUNCTIONS AND COMPONENTS OF THE WISCONSIN R & D CENTER FOR COGNITIVE LEARNING

science. The implications of programs implementing Individually Guided Education for the preparation of school personnel, primarily principals and lead teachers, are being incorporated in pilot graduate programs in a fourth project.

Figure 2 relates the functions of the various organizational components of the Center. Personnel in Program 1 conduct research on the conditions and processes of learning and develop curriculum materials and procedures. In Program 2 efforts focus on large-scale developments and development-oriented research. Combined, Program 1 and 2 comprise the substantive activities of the Center. Facilitative environments developed in the former Program 3 are maintained by the management elements of the Center. These environments provide the setting for a substantial part of the research and development activities in Program 1 and 2. They also provide the setting for the quality verification and demonstration of Center outputs. The Center takes initiative for working out arrangements with other agencies for dissemination, further wide-scale field testing, and installation of Center outputs.

Program planning occurs at three levels. The Center director and Executive Committee are responsible for formulating the major design of the two programs and the three sections. The principal investigators and their staffs are responsible for planning at the project level in the context of the annual program plan. The Management Council is responsible for planning with the prinicpal investigators at the activity level. The objective is to involve a broad segment of the Center staff in planning their own activities, rather than carrying out activities planned by others. The Executive Committee and other permanent and ad hoc committees generally include members from the three levels. Also, principal investigators and section directors participate heavily in the development of the major design.

Personnel of the Technical Development Section, Business and Operations Section, and Dissemination Section provide technical knowledge and support services to the program personnel. Further, some section personnel participate directly in research and development activities. The Technical Development Section assumes primary responsibility for quality verification of instructional materials and tests, manages all data processing by computer, and assists in the design of experiments and field tests. The Dissemination Section has direct responsibility for Center publications and other dissemination activities.

AN INTEGRATING MODEL[1]

Out of the Center's efforts to develop a self-renewing system of elementary education have come the present concepts and practices of Individually Guided Education. These have emerged after six years in an iterative cycle of research, development, testing and revision.

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[1] Individually Guided Education in the Multiunit Elementary School: Guidelines for Implementation, Herbert J. Klausmeier, Richard G. Morrow, and James E. Walter

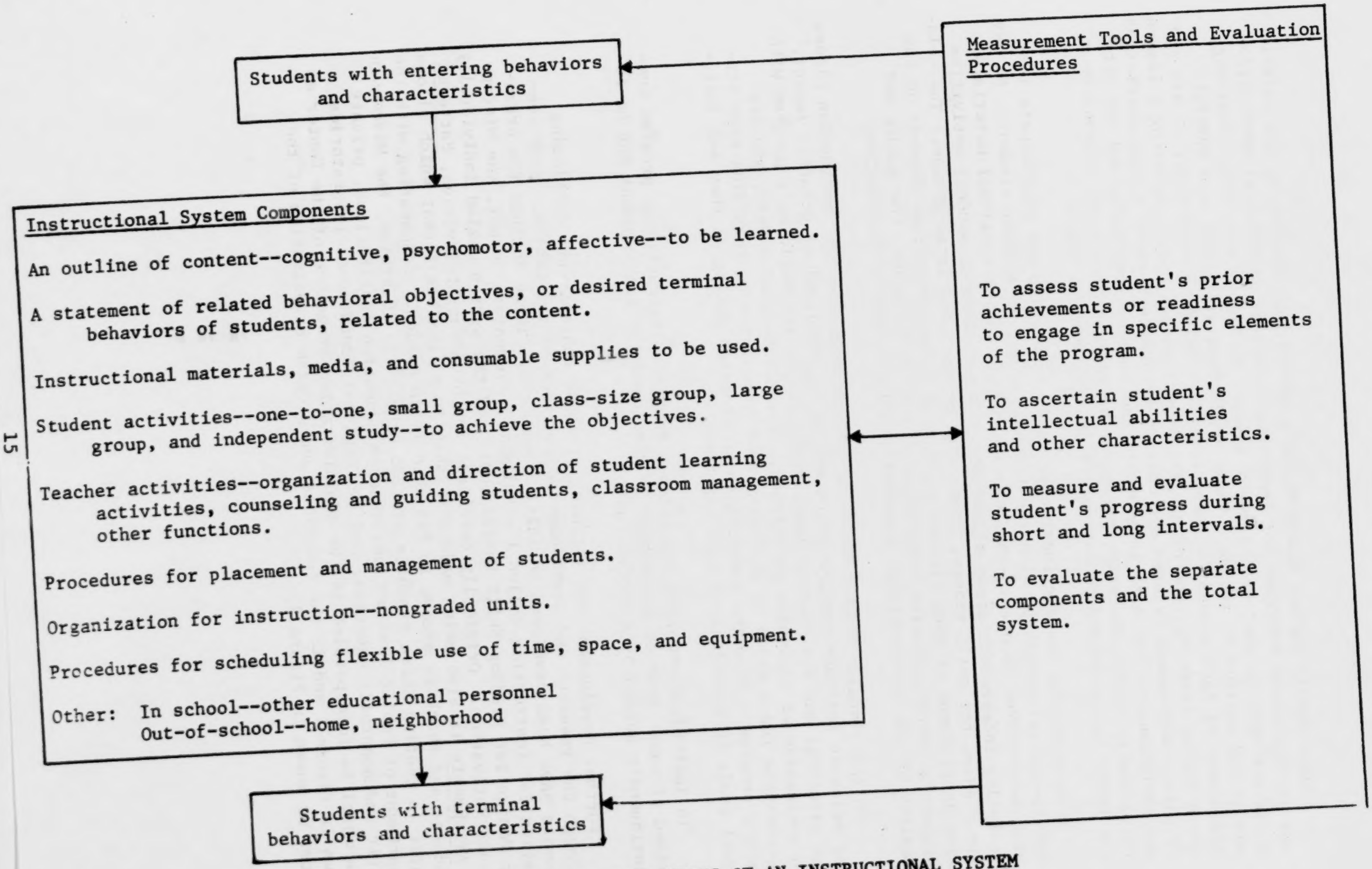
Students with entering behaviors and characteristics
Measurement Tools and Evaluation Procedures
Instructional System Components
An outline of content--cognitive, psychomotor, affective--to be learned.
A statement of related behavioral objectives, or desired terminal behaviors of students, related to the content.
Instructional materials, media, and consumable supplies to be used.
Student activities--one-to-one, small group, class-size group, large group, and independent study--to achieve the objectives.
Teacher activities--organization and direction of student learning activities, counseling and guiding students, classroom management, other functions.
Procedures for placement and management of students.
Organization for instruction--nongraded units.
Procedures for scheduling flexible use of time, space, and equipment.
Other: In school--other educational personnel
Out-of-school--home, neighborhood
To assess student's prior achievements or readiness to engage in specific elements of the program.
To ascertain student's intellectual abilities and other characteristics.
To measure and evaluate student's progress during short and long intervals.
To evaluate the separate components and the total system.
Students with terminal behaviors and characteristics

Figure 3: MAJOR COMPONENTS OF AN INSTRUCTIONAL SYSTEM

Individually Guided Education is a system for formulating and carrying out instructional programs for individual students in which planned variations are made in what each student learns, in how he goes about learning, and in how rapidly he learns. These variations are based on a careful assessment of each student's characteristics before instruction, of his progress during learning, and of his final performance upon completing a lesson or unit. Assessment is used not only to determine a child's characteristics and performances, but also to evaluate the various components and the total Individually Guided Education system. The various structural components of the Individually Guided Education design are shown in Figure 3.

In attaining instructional objectives each child may participate in one-to-one relationships with the teacher, aide, or another student. He may also be involved in one-to-one relationships with instructional materials, including independent study situations. Other kinds of student activities are planned for small groups, class-size groups, and large groups. The relative involvement of each student in each of these activities depends on the student's characteristics, the objectives to be attained, the nature and quality of the instructional materials, and the cost of instruction.

In Individually Guided Education the organization for instruction places the relevant instructional decision making at the level of greatest impact. The principal and his instructional staff decide the building's program within systemwide or statewide guidelines. The teachers of a Unit, who are responsible for a group of children, make the decisions regarding each student's program. Students participate in decision making as they set individual goals in consultation with teachers.

In Individually Guided Education a complete instructional program comprised of many kinds of activities is developed for each student and he is continuously guided by a professional.

Further development and refining of these concepts are continuing through the research and development activities of the Center. Some components have been developed in initial versions. These include the organization for instruction called the Multiunit Elementary School, the Wisconsin Design for Reading Skill Development, and the system called Individually Guided Motivation. Originally developed for broadcast television, Patterns in Arithmetic is also being made available in a flexible format which allows students and teachers access to PIA when it is needed. Cooperating with the Center in testing these products are 275 schools in 10 states, the Wisconsin Department of Public Instruction, teacher education institutions, private profit and nonprofit agencies, and two regional educational laboratories. This model is incorporated in the administrative structure of the Center as shown in Figure 1 and in the functions and program organization of the Center as shown in Figure 2.

Program Activities and Accomplishments

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

PROGRAM 1: CONDITIONS AND PROCESSES OF LEARNING

This program's objectives--to generate new knowledge about concept learning and cognitive skills; to synthesize existing knowledge and develop models, taxonomies, or theories of cognitive learning; and to utilize the knowledge in the development of curriculum materials and procedures--are expressed in the activities of its projects. Based on research conducted since 1964 and synthesized with other existing knowledge, a model of cognitive operations in concept learning is taking shape. Research has been started to identify the interrelationships of concept attainment across subject matter fields and with basic cognitive abilities related to concept attainment. Subsequent to research on the effects of peer group pressure, efforts are focusing on the development of theory and improved practices regarding peer teaching techniques at the elementary school level. Following the investigation and identification of some prereading skills, tests which identify children 4-6 years of age who lack these skills, and instructional materials and procedures which develop the specific skills, are being prepared. Research on creative thinking has led to a model which was used as the basis for the development of instructional materials. Theory and research related to motivation have resulted in the development of a system of individually guided motivation incorporated in inservice materials for teachers.

Project 101: Situational Variables and Efficiency of Concept Learning

Two major objectives have been defined for this project: (1) to clarify the nature of cognitive learning and to apply that knowledge in the development of instructional materials by Center personnel and others, and (2) to develop a system of individually guided motivation for use in the elementary school.

Research on Cognitive Learning

Systematic research has been carried out to develop a model of cognitive operations in concept learning, to identify variables which facilitate concept learning, and to identify individual differences in perceptual and cognitive abilities.

A model of cognitive operations involved in concept learning was outlined in a working paper. In this model, global strategies in concept attainment are hypothesized to consist of three phases: attending to the situation, searching for information, and processing and using information. Specific cognitive operations entailed in the three phases are identified. At present, a book-length monograph is being written which will integrate research related to the model of cognitive operations.

Two experiments were carried out during the past year to clarify components of the model. The first study dealt with the ways in which children encode verbal material. Second-grade children encoded predominantly acoustic properties of words, while fourth- and sixth-grade children encoded the denotative or connotative meaning of words. The second study investigated

the bases used by fifth-, eighth-, and eleventh-grade children to classify geometric figures. The use of perceptible characteristics for classifying decreased with increasing grade, while the use of shared attributes and superordinate concept names increased.

Identification of the variables which facilitate concept learning has entailed the development of a paradigm for testing children's level of concept mastery, research concerning the effects of sequencing of instructional material, and research concerning word relationships and within-sentence variables that facilitate concept learning.

The paradigm for assessing level of concept mastery, consisting of a set of clearly defined tasks, has served as the basis for research having both theoretical and methodological significance. Tests for school-based experiments in mathematics have been constructed utilizing the paradigm. Tests have also been developed for a factor analysis of the structure of concept attainment abilities. Preliminary analyses indicate that the tasks which comprise the paradigm may form a hierarchy and that this hierarchy is the same for concepts from different subject matter areas. Finally, explicit task description has permitted an empirical study of the content validity of a social studies test.

One experiment has been carried out to clarify the effects of sequencing on concept learning. This study revealed that sixth-grade children remembered concepts better after a three-week interval when they had been taught by a "discovery" method rather than by an "expository" method.

Research concerning word relationships and within-sentence variables has provided evidence for the following: (a) there is superior learning for items that are objects of a transitive verb when compared to items that are objects of a preposition; (b) interference in learning can be eliminated by the use of transitive verb sentence frames; (c) pronounced interference in learning may occur when multiple-meaning words are used; and (d) the use of sentence frames that have a general rather than a specific relationship to one another produces positive transfer.

The identification of perceptual and cognitive abilities has focused on individual differences in the ability to learn from verbal and pictorial materials as well as on the relationship between voluntary motor activity and the perceptual process. A key step in the identification of individual differences in the ability to learn from verbally and pictorially presented instructional materials is the development of a test battery to identify stimulus mode preferences of individual students. This battery is being constructed and pilot tested, and will be ready for use in late 1970.

Several studies concerned with the effects of verbal and pictorial presentation have also been completed. One, concerned with the role of visual imagery in learning, suggests that while semantic properties of learning materials have an effect on the performance of both older and younger children, the ability to utilize effective strategies--such as visual imagery--either spontaneously or under instructions to do so, is closely related to age. Sixth graders seem to benefit from an experimenter's suggestion to

"think of a picture in your mind" prior to learning, while third graders do not. College students, on the other hand, tend to incorporate their own mediational techniques on learning tasks, although experimenter-provided instructions to use their imagination improve their performance.

The intimate connection between verbal, pictorial and imaginal components is currently being studied by means of manipulation of stimulus and instructional variables. Some recent data have indicated that the ability to use imagery may also depend on the form or mode in which materials to be learned are initially presented. The results of this kind of research, conducted among children of different ages, have offered some insight into the cognitive strategies employed by subjects at different stages of intellectual development.

The effect of active manipulation on perceptual behavior has been studied in two experiments. In the first study it was found that when 4-year-old and 6-year-old children were required to trace nonsense forms, subsequent recognition of the forms was no better than when they had merely examined them visually. Previous research, however, has indicated that when children are permitted to deal with materials in any way they desire, those who choose to trace exhibit superior recognition in comparison to those who do not. Together, these results suggest that an imposed tracing strategy may not facilitate performance, whereas voluntary tracing does.

A second study investigated the effects of repetition and type of motor activity on judgments of length using a visual display. Results showed that active movements led to more accurate judgments than passive movements. Repetition of movements also improved performance. These findings have implications for the effective use of active manipulation of materials in instruction.

Individually Guided Motivation

A system of individually guided motivation has been developed which incorporates specific procedures by which teachers can markedly increase motivation for learning.

Previous research established that individual conferences with children concerning their independent reading substantially increase the number of books which they read; also, that small group conferences with children lead to growth in self-directed behavior. During the past year, teacher training packages consisting of a kinescope and a practical paper were developed for each of these procedures. Formative evaluation of the training package for independent reading conferences has already been carried out. Results of this evaluation suggest that schools can establish a successful conference program based solely on the information contained in the package.

Finally, an experiment was conducted to determine the effects of individual weekly conferences in which goals were set concerning achievement of reading skills. Over a three-week period, the children in the first through fourth grades who had conferences learned to set more accurate goals than children who did not have conferences. Also, children in first and second

grade who had conferences had significantly higher achievement in reading than children who did not have conferences.

This project was initiated in September 1964 and has been extended to deal more comprehensively with cognitive learning and instruction. One principal investigator has been associated with the project since its inception. Research dealing with word relationships and within-sentence variables was begun when a second principal investigator joined the staff in September 1968. In September 1969 two additional principal investigators came into the project to study perceptual and cognitive abilities. Thus, the current staff includes four principal investigators. Other staff members include one full-time research associate, one full-time project specialist, eight graduate assistants, one fellow, and two secretaries. The main outputs from this project have taken the form of twenty-seven technical reports, one theoretical paper, five working papers, two practical papers, two technical memos, and one book.

Project 102: Motivation and Individual Differences in Learning and Retention

Objectives of this project are (1) to determine at what point in learning motivational and attentional manipulations have their greatest effect on retention, and (2) to identify significant measures of individual differences intrinsic to the learning process that can be utilized to improve learning and memory.

The work on motivation/attention is based largely on contemporary arousal or activation theory. The individual differences analyses are based on a concept of "intrinsic" individual differences, that is, individual differences intrinsic to the processes of learning. The memory (or learning) theory employed is a form of consolidation theory. Research indicates that certain arousal, attention and individual difference variables affect long-term retention differently from short-term retention.

This project is concentrating on complex learning as represented in learning from text. The project is pursuing a systematic attempt to influence children's processing of text in short- and long-term memory by motivation/attention variables and knowledge of intrinsic individual differences. Attentional and individual differences analyses have great promise for any area of learning, and one to be studied is the acquisition of reading. Here, the facilitating effects of arousal and orienting responses in processes of discrimination will be studied.

One of the major prose learning studies demonstrated significant facilitation of short-term retention and long-term retention by inserting questions within the text material. This study demonstrated a marked interaction of question effects and I.Q. Questions particularly facilitate retention in low I.Q. children. Work on individual differences in arousal and children's processing of prose has suggested that reading time for prose materials is a function of an interaction between questions within text and intrinsic arousal. When such questions were present in text, intrinsic arousal was significantly related to reading time. When they were not present, the relationship was markedly attenuated. These results were demonstrated on fourth and

sixth graders learning relatively simple passages. These findings suggest that reading speed is affected when individual differences in arousal are related to manipulated arousal (as presumably represented by the questions).

The research on arousal, attention and signal value in prose has also suggested that pictures (non-representational line drawings) irrelevant to the prose material being processed can have as much or greater an effect on retention as can relevant questions or relevant pictures, that is, pictures relevant to the material being processed. The effectiveness in facilitating learning was in the following rank order: irrelevant pictures, relevant questions, relevant pictures, no experimental manipulation.

Future research will continue to examine the arousal, attentional (including orienting response) and intrinsic individual difference variables that are related to the child's processing in short- and long-term memory of textual and within-sentence information, testing for both factual and inferential knowledge. Variables that influence the attentional or signal value of information in prose (e.g., arousal properties, interestingness, pleasingness, imagery, concreteness, redundancy, etc.) will be studied. Related work will examine the independent variables mentioned above in relation to basic reading acquisition paradigms and also in relation to the short- and long-term memory performance of economically disadvantaged children.

One principal investigator has been associated with the project, which was started in 1965. In the past year, three research assistants have helped conduct the research and prepare the reports. Reports from the project include eleven technical reports and three working papers.

Project 103: Task and Training Variables in Problem Solving and Creativity

Two thrusts provide the focus for this project. One is the development of materials for teaching young children attitudes and techniques for becoming creative problem solvers. The second is research to examine the effects of training, nature of the problem, and personality on creative problem solving.

Data from an inner-city field evaluation of Thinking Creatively: A Guide to Training Imagination were analyzed. Generally, two of four trained groups showed moderate improvement in tested creative ability. However, problems associated with reading difficulties, teacher handling of the material, and perhaps insensitivity of some creativity tests complicate the interpretation of the data.

Two new sets of creativity training materials, an upper-elementary creative writing workbook entitled Write? Right! and a general creative thinking program called Saturday Subway Ride, both written by a professional creative writing group, were completed and await preliminary field testing scheduled for the coming academic year (1970-71).

A research project with sixth-grade students in four Madison schools provided validating information for a newly developed convergent thinking test, the Warren and Davis Distant Linking Exam.

Another basic research study examined interrelationships among three commercially available tests of creativity, the Torrance Tests of Creative Thinking, the Remote Associates Tests, and the Alpha Biographical Inventory. I.Q. measures were included in the correlational study. At the time of this writing, data had not been fully analyzed.

During the 1970 spring semester the principal investigator, supported 100 percent by local funds, was on research leave during which he prepared a scholarly book summarizing theory and research in problem solving and creativity training. The manuscript is titled It's Your Imagination: Theory and Training of Problem Solving. Arrangements for the publication of the manuscript by Basic Books were completed prior to the effective date of the OE copyright guidelines. The book will be copyrighted with royalties to go to the author.

Started in September 1965, this project completes its activities as of August 31, 1970. The primary outputs of this project are Thinking Creatively: A Guide to Training Imagination, Write? Right!, and Saturday Subway Ride. Other completed outputs include five technical reports and two theoretical papers. During the past year the project staff included one principal investigator, one project specialist, and two half-time research assistants.

Project 104: Basic Pre-Reading Skills: Identification and Improvement

The need to find effective remedies for reading failure is clear and urgent; it is just as clear that preventive measures are preferable to remedial ones. The identification and development of preventive measures have dictated both the basic and applied research goals of this project.

The search for preventive measures began with the assumption that some children fail in early reading acquisition because they lack necessary cognitive skills and concepts. Research undertaken in 1968-69 confirmed the existence of several independent pre-reading skills which were generally lacking in lower SES kindergartners. Two skills in particular, the ability to match letters and the ability to manipulate segments of sound smaller than the word, are logically necessary to later letter-sound correspondent learning. These two skills correlated highly with alphabet recognition performance (a good predictor of later success in reading), but were independent of measures of word memory span, vocabulary size, concept sorting, and paired-associate learning. All measures correlated significantly with standardized readiness tests. A longitudinal investigation of the correlation of these skills with later reading achievement is being made. Project research has shown articulation--the ability to pronounce the sounds of English correctly--to be unrelated to reading achievement. The relation of speech-sound discrimination ability to reading achievement is currently being studied.

Concurrent studies of letter-sound correspondence learning in elementary school children revealed a strong relationship with reading and achievement tests, the correlation being highest for the youngest children studied (2nd grade). This evidence was taken to support the working hypothesis that

acquisition of decoding skills is of paramount importance in early reading.

The most recent research (1969-70) has focused on the sources of matching skill deficits and evaluation of training procedures for matching and sound-segmentation skills. It was found that kindergartners were not distracted by visually similar letter configurations. Rather, they failed to attend to the orientation and ordering of letters in finding "same" exemplars. Although up-down orientation of a letter was attended to better than left-right orientation in simultaneous matching, all information about orientation appeared to be unavailable when the child matched from memory. To the child, apparently, two objects are the "same" regardless of their orientation in space; two sets of objects are the "same" if they contain the same objects. These concepts are appropriate to the child's experience with objects, but they will prove disastrous in the discrimination and identification of words and letters. Corrective feedback over a series of 48 trials proved insufficient to change the kindergartners' processing of orientation information. In another experiment, children commonly picked out correct and reversed-order matches, but when given explicit instruction to choose just one, chose the correct alternative.

Teaching the pre-literate child to attend to sound segments of words proved extraordinarily difficult. Training procedures reported to be successful in the Russian literature, requiring up to two hours of distributed practice, yielded no transfer of learning. The attempt to replicate training procedures reported by El'Konin was carried out by Dr. Larry Wilder in a satellite activity related to this project. Little learning was evident in five trials on an extremely simple segmentation-concept task ("If I say Chief, you say -ief; if I say Soap, you say -oap"). While children could learn to match single sounds and colored blocks by rote, they could not match the same sound presented in a nonsense syllable. Next year's research will focus in depth on the testing and training of these skills.

Byproducts of project research have included contributions to the methodologies of articulation, speech-sound discrimination, acoustic phonetics, and language acquisition. Assessment tests have been developed for articulation, letter-sound correspondence mastery, and those basic prereading skills already identified. Knowledge of the child's linguistic and reading development has been extended through developmental studies of articulation and letter-sound correspondence acquisition.

This project started in June 1966. The current staff includes two principal investigators, one full-time research associate, one full-time specialist, four graduate assistants, two graduate affiliates, and one secretary. The outputs of this project are incorporated in eleven technical reports, one theoretical paper, and five working papers.

In progress are a book, The Linguistics and Psychology of Reading (Venezky and Calfee), which is approximately one-half completed, and a monograph on the articulation abilities of young children (Venezky, Calfee, and Chapman), which is approximately one-quarter completed. The book will contain an extensive review of reading research from 1880 until the present, along with the results of work done by this project. Both were written while the

principal investigators were on research leave.

Project 107: Role Theory Analysis of Peer-Teaching Techniques

This project, formerly known as the Peer Group Pressures on Learning Project, focuses on identifying the effects of peer group pressures on the utilization of concepts already learned, and on identifying how peer group pressures affect the learning of new concepts. Research has been completed and the results have been reported in Center publications. Under the new title the objectives of this project are: (1) to provide an understanding of the psychological factors involved in the (presumed) effectiveness of using children as teachers of other children in elementary school; (2) to delineate, in a systematic manner, the consequences of this procedure to the child acting as teacher and to the child acting as learner in the peer-teacher technique; (3) to provide a greater understanding of the psychological factors responsible for any changes in personality, attitudes, and achievement due to peer-teaching; (4) to specify, as a result of theoretical analysis and empirical findings, optimal methods for the use of peer-teaching techniques.

To date project staff have completed a draft of a literature review on the topic of peer-teaching, explored materials and procedures for experiments this fall, and are now at the point of conducting pilot tests for determining the suitability of materials (e.g., arithmetic, reading, etc.) and procedures for children of elementary age.

In the fall, data collection will begin. The first study will be directed toward confirming the effectiveness of the peer-teaching technique. Literature review has revealed that, unfortunately, programs using peer teaching techniques have not been adequately evaluated. Initial studies will therefore attempt to employ sufficient control groups to establish the authenticity of the effectiveness of peer-teaching, i.e., to show that its effectiveness is greater than can be accounted for by extraneous factors or artifactual effects.

Once this basic series of studies has been conducted, the plan is to use a fairly standardized procedure in further studies in order to enhance comparability among studies. Tape recordings will be made of the interaction between the peer-teacher and the student. Other dependent variables include changes in achievement, motivation, attitude, and self-concept of both members of the dyad. The project intends first to explore several of the parameters of the peer-teacher situation, with a view toward determining the most effective conditions of peer-teaching: e.g., age spacing, similarity-dissimilarity of the members of the dyad. Once these gross, basic parameters are understood, studies will be conducted specifically to test alternative theoretical explanations of the psychological mechanisms mediating the peer-teaching effect. Finally, the project will prepare a book-length report of these studies, along with a theoretical framework to account for the results.

This project was initiated in June 1965 and is comprised of one principal investigator and one half-time research assistant. The project's research has been reported in nine technical reports and one theoretical paper.

Project 111: A Structure of Concept Attainment Abilities

The overall objective of Project 111 is to formulate a model or structure of abilities in concept attainment, from which can be derived implications for the teaching of concepts to pupils in the upper elementary grades. Of particular interest are the interrelationships of concept attainment across four subject matter fields--mathematics, social studies, science and language arts. Additionally, three well-known structures of cognitive abilities--Thurstone's Primary Mental Abilities, Guilford's Structure of Intellect, and Guttman's view of intellectual abilities--will be related to one another and to the level of concept attainment in the subject matter fields.

The strategy for accomplishing the objectives of the project include the identification of basic classificatory concepts presented in textbooks written for fourth-grade pupils in the four subject matter fields; the development of tests to measure level of concept attainment; the development and identification of reference tests for cognitive abilities; and the testing of large samples of fifth-grade students on test sets.

Excellent progress has been made during the past year toward the accomplishment of the project's objectives. Concepts in the four subject matter areas have been identified and thirty in each area selected and analyzed. For each concept 12 items have been developed according to the paradigm for testing children's level of concept mastery (see Project 101). In all, 360 items have been developed and refined for each subject matter area.

Twenty-two cognitive abilities tests appropriate for fifth graders were constructed, field tested, and revised on the basis of item analysis results. These were combined with other available tests deemed appropriate according to difficulty level and on a conceptual basis. The resulting battery of 56 cognitive ability tests will be used to relate cognitive abilities to concept attainment in the four subject matter areas.

Data have been collected for preliminary factor analytic studies in social studies and mathematics and in cognitive abilities. The results of the preliminary studies will determine which subtests are to be included in a final study of interrelationships.

The hierarchical organization of the tests for the twelve task types is being studied by using simplex analysis. The tests for each task type are composed of one item of that type for each of the concepts being studied. These are analyzed separately for each subject matter. Preliminary results suggest that the hierarchy of task types is consistent across the subject matters studied.

Begun in February 1969, the project to date has published one technical report. The five batteries of tests developed have been placed under developmental copyright. Six principal investigators participate in the project's activities, which are managed by a research associate with the advice of an executive committee. Additionally, the project employs one full-time project specialist, two half-time project specialists, a one-third time research associate, and one half-time project assistant.

PROGRAM 2: PROCESSES AND PROGRAMS OF INSTRUCTION

The primary objective of this program is to develop curriculum materials and instructional procedures for elementary and preschool children. Related objectives are to identify sequences of concepts and cognitive skills within and across subject matter areas and to generate knowledge about instructional procedures. Programs to prepare educational personnel for new roles in the Multiunit Elementary School and to handle new curriculum components of Individually Guided Education are also being developed. The first elements of a reading program were formatively evaluated and prepared for large-scale field testing in the fall of 1970. Other reading program components have progressed and will be ready for final formative evaluation in the fall of 1970, and for large-scale field testing in the fall of 1971 and 1972. Materials in elementary mathematics were developed for arithmetic and geometry for early primary levels; these are in various stages of formative evaluation. In elementary science, experimental materials related to the particle nature of matter were completed and used in the conduct of research to determine how children best learn selected science concepts. Also in science, needs were identified and specifications for an elementary program in environmental/ ecological education were outlined. A graduate program for lead teachers was outlined; this program will link teacher-training institutions more closely with schools in improving educational practice.

Project 201: Individually Guided Mathematics

This project is comprised of three elements: Patterns in Arithmetic, Analysis of Mathematics Instruction, and the Computer Managed System of Mathematics Instruction.

Patterns in Arithmetic: In the spring of 1969, development of materials related to Patterns in Arithmetic was completed as the TV lessons and related printed materials for grade 6 were produced. The Technical and Dissemination Sections' activity relative to PIA reflect the Center's continuing responsibility for the program. In this regard the Northwest Regional Educational Laboratory (NWREL) continues to use PIA in its Small Schools Program, to determine the feasibility of using PIA as audiovisual material on portable equipment and to determine its instructional effectiveness when used more flexibly than is possible in broadcast dependent situations. Results of early efforts in the Small Schools Program indicate that on the average PIA students in the remote rural schools performed better than did the original field test students in Wisconsin and Alabama.

Two important results have emerged from the cooperative activities among the Wisconsin Research and Development Center for Cognitive Learning, the National Instructional Television Center (NITC), and NWREL. First, beginning this fall, PIA will be available for purchase in a flexible, portable format. Schools will be able to obtain PIA on half-inch or one-inch video tape and use the series on portable video tape recorders. The flexibility realized by these arrangements will allow students and teachers to use the audiovisual materials when needed, rather than according to a fixed broadcast schedule. Second, experience in the NWREL project indicated a need to revise the

teacher's manuals for grades 1-3; revision of the manuals for grades 1 and 2 is complete, and the third-grade manual is under revision.

Two Center proposals, one for evaluation of PIA as used in the field and the other for the national dissemination of PIA, were funded by OE. Parts of PIA were field tested during development, but no information has been gathered since then. Thus, the evaluation which will be conducted during the 1970-71 school year will provide extensive information about PIA as it functions under regular conditions.

PIA is currently used by some 385,000 children in 18 states, and plans have been developed with NITC and NWREL to increase its adoption nationally through use of funds provided by the National Center for Educational Communication. This involves a direct mail effort to reach a national sample of potential adopters and a series of regional conferences.

In addition to the 336 fifteen-minute video tape lessons, the teacher's manuals, and student workbooks for grades 1-6, other outputs of this element include eight technical reports and three working papers. Development of PIA was begun in 1964.

Analysis of Mathematics Instruction: The staff of this project continued to develop an individually guided system of instruction in elementary mathematics. A second version of a Teacher's Guide for Arithmetic Book I: Comparing and Equalizing Objects and Sets, was prepared and utilized by four teachers with more than 200 children. This book is designed for beginning elementary school children at the kindergarten level. Its major emphasis is on pre-numeric activities that prepare a child for the usual arithmetic activities that he will meet during his primary school years. Careful monitoring and evaluation of children's performances related to this program of instruction have indicated a high level of achievement of the stated objectives by the children.

In connection with Book I, a comprehensive set of criterion referenced tests was developed for group or individual use. By administering the test to a child after he completes the activities of Book I, the teacher will be able to assess that child's progress and will also be more able to suggest future learning activities. The tests may also be administered prior to instruction in Book II concepts to assess each child's readiness for the instructional program.

A first version of Teacher's Guide for Arithmetic Book II: Writing Mathematical Sentences was also produced. The activities suggested by this book follow directly from those in Book I and lead up to the writing of addition and subtraction sentences involving numbers less than or equal to 10. This book was utilized by five teachers with about 150 children. Evaluation again indicates a high level of achievement by the children.

A pilot tryout of materials for the next level of instruction was also carried out during the past year. One class of second grade level children was involved. Day by day monitoring of classroom activities and careful analysis of mathematical and pedagogical implications of these activities

has led to the initial production of a Teacher's Guide for Arithmetic Book III: Writing Mathematical Sentences with Larger Numbers and also materials for use by students. These will be used in a larger tryout during the next year.

An instructional task analysis was carried out relative to the preparation of materials to be used in a pilot tryout at the fourth level of instruction in arithmetic. This tryout will be carried out during the forthcoming year and will result in materials for students and a Teachers Guide for Arithmetic Book IV: The Negative Integers.

Geometric content was further identified and studied. Activities related to this subject and appropriate for children from age 5 to 8 have been prepared and will be tried, refined, and re-tested during the next year. These will then be incorporated in Geometry Books I-IV.

Research efforts have been continued in the study of the basic assumptions about mathematics instruction and learning. One study was carried out in geometry instruction, and studies in probability, creativity, and logic and proof were published.

This element of Project 201 includes two principal investigators, one associate scientist, three full-time specialists and three graduate students. Since its inception in June 1967 outputs are incorporated in two Teacher's Guides, three technical reports and five working papers.

Computer Managed System of Mathematics Instruction: This portion of Project 201 was organized to design, validate, and demonstrate a Prototypic Computer Managed System of Mathematics Instruction (CMSMI) generalizable to a broad spectrum of instructional modes, classroom and school organizational patterns, and subject matter areas. The CMSMI has been developed and operated during the 1969-1970 school year in the W. C. Giese School in Racine, Wisconsin. Its design has been completed and validated in a mathematics program for grades 4-6. It has also been adapted for use with the Wisconsin Design for Reading Skill Development by the Technical Development Section.

One principal investigator, a half-time project specialist, and a half-time project assistant comprised the staff of this element of Project 201. Project staff have completed one technical report. In addition, five reports are in preparation. As of August 1970, this element, begun in January 1969, will have completed its activities and final reports will be prepared.

Project 203: Prototypic Instructional Systems: Elementary Science

During the past year research activities designed to ascertain the relationship between the level of maturity of the learner and his ability to learn certain kinds of concepts related to the schema about the particle nature of matter have been concluded. A needs analysis and specifications for the development of a series of supplementary readers in environmental education were incorporated in a working paper.

In connection with the particle nature of matter, the experimental materials include instructional films, transparencies, models, tests, and lesson plans. The research indicates that children best learn the concepts when models are used, when functions are taught along with the structures and when these are part of conscious experience, and when students are provided with appropriate real experience. Finally, learning various levels of concepts when reading is minimized is not related to I.Q. but to maturity and verbal instruction.

With regard to the new project, a portion of the year's work consisted of an analysis of the current scene in elementary science education, specifically to identify deficiencies. An overview of this analysis is presented in a working paper, Environmental Education in the Elementary School: Needs and Specifications. Consideration was also given to study of present and future needs pertaining to children, society, and science and science-related disciplines.

These analyses led to two major decisions regarding future research and development activities in the Center: (1) the developmental activity of the new science project will focus on environmental/ecological education, and (2) curriculum components will emphasize the interrelationships among science, social studies, and environmental management. In addition, the materials produced will contribute to the improvement of reading skills, particularly comprehension and vocabulary. Children in the intermediate grades of the elementary school were identified as the initial target group.

During the year the project staff consisted of two principal investigators and two half-time research assistants. Outputs of the efforts related to the schema on the particle nature of matter, in addition to the materials already mentioned, include eleven technical reports and five practical papers since February 1965.

The new science activities began in September 1969. Most of the past year has been devoted to a needs analysis and the development of specifications which are reported in a working paper.

Project 204: Reading and Related Language Arts

For the past year, the activities of this project centered primarily around the Wisconsin Design for Reading Skill Development (WDRSD). The Design provides an outline of reading skills that, by long-standing consensus, are essential for competence in reading and behavioral objectives associated with each skill; contains criterion referenced tests to assess individual pupils' skill development status in terms of explicitly stated behaviors related to each skill; provides resources information for planning for individual student skill development; and has the procedures for managing the instruction of large numbers of students simultaneously.

The Design organizes instruction for grades K-6 around six skill areas: word attack, comprehension, study skills, and self-directed, interpretive, and creative reading skills. The Design includes the following elements for each of the first three skill areas:

Rationale and Guidelines: A comprehensive statement that includes an overview of the rationale and development of the Design; a detailed description of the nature and functions of the several components of the Design; general guidelines for implementing and adapting the Design; and detailed discussion of specific application. It is written for reading consultants, principals, unit leaders--the decision-makers who will assume leadership roles in installing and maintaining the WDRSD in local schools.

Teacher's Planning Guide: A guide to implementation written specifically for teachers who will work with the Design.

Wisconsin Tests for Reading Skill Development: Criterion referenced tests include items for each of the specific skills. Each test has an accompanying administrator's and technical manual, and is available in two forms. One form, a battery of several subtests, is for initial assessment; the second, a single test format, is for retesting.

Guides to Informal Skill Observation: Guides intended as models for individual skill assessment compatible with and complementary to the formal tests.

Teacher's Resource File: Includes lists of published materials and teacher directed activities keyed to the same skills as the tests. Also projected are materials to put in the hands of children as an alternative to the Teacher's Resource File so that schools may choose whichever best meets local needs.

Pupil Skill Profile Cards: A card sort system is the basis of the Design's management component. Each of the skills is listed on a card, and when a child has mastered a skill his card is notched. When the cards are sorted by skill, students who have or have not mastered a particular skill can be identified.

For the last three skill areas, the following component has been designed: Guidelines for Self-Directed, Interpretive, and Creative Reading Skills. This collection of guidelines is a resource book for teachers.

During the past year major efforts of Project 204, the Technical Development Section, and the Dissemination Section were devoted to readying the word attack element of the Design for large-scale field testing during the 1970-71 school year. Accordingly, the formative evaluation of the various components was completed and a printing and machine scoring service engaged. A model inservice program for school personnel in leadership positions was conducted for representatives of schools participating in the field test. A field test plan was formalized, schools were identified, and a cooperative arrangement was made with the Southeastern Educational Laboratory, which will conduct the field test in that region.

As the field test of the word attack portion of the Design is carried out during the coming year, development of the study skills and comprehension

elements will continue. Projections are to have study skills ready for field testing during 1971-72 and comprehension ready for 1972-73.

During the past year the staff of the project, which started in September 1966, included two principal investigators, two research associates, one project specialist, and six half-time research assistants. In addition to the materials mentioned above, other outputs include thirteen technical reports, eleven working papers, two practical papers, and three theoretical papers.

Project 207: Preparing Personnel for Differentiated Instructional Roles

Three objectives provide the focus for this project:

1. To facilitate the development, implementation, and evaluation of a model, replicable program for preparing instructional personnel for differentiated roles, supported by EPDA funds.

2. To clarify through research and development the roles of school personnel working in and with differentiated staffs, e.g., lead teacher, staff teacher, principal, interns, aides, and central office personnel.

3. To provide liaison with the University of Wisconsin's School of Education for communicating teacher education implications from the development and refinement of Individually Guided Education in the Multiunit Elementary School, especially those implications for differentiated instructional roles.

In moving toward these objectives during the past year project staff prepared an EPDA proposal. This proposal involved a consortium of five teacher education institutions in Wisconsin and the State Department of Public Instruction. The teacher education institutions are the University of Wisconsin at Madison and Milwaukee, Marquette University, and the Wisconsin State Universities at Eau Claire and LaCrosse. Late in the spring 1970 the proposal was funded.

With these funds and funds from an earlier EPDA grant two summer programs for personnel in differentiated instructional roles have been conducted. These programs represent the beginning of graduate programs for such persons on the University of Wisconsin-Madison campus.

Presently the staff consists of three principal investigators and one half-time project assistant. The project was begun in September 1969.

CENTER SECTIONS: DISSEMINATION, TECHNICAL DEVELOPMENT, BUSINESS AND OPERATIONS

The staffs of the Dissemination, Technical Development, and Business and Operations Sections provide technical knowledge and services to program personnel.

Dissemination

An important component in educational research and development strategies is a program for disseminating the substantive and procedural results of R&D activities. The objectives of the Center's dissemination activities are: (1) to communicate with the scholarly community, (2) to interpret activities to school personnel, and (3) to stimulate the adoption and installation of the Center's substantive and procedural results. It is apparent now that the Wisconsin Research and Development Center for Cognitive Learning must go much further in field testing, demonstrating, and installing, since it has not been possible to work out productive working relationships with regional educational laboratories to assist in these processes.

Since the Center's beginning in 1964, nearly 275 different titles in its regular publications have been published. Seven hundred copies of each technical report and theoretical paper are distributed to major universities nationally and internationally, to state education agencies, scholarly organizations, the Office of Education and Office of Education agencies, as well as to selected individuals and school districts. Working papers and reproductions of theses or dissertations are distributed less widely, unless they are of particular significance. Special reports are issued from time to time and are sent to selected audiences. One of these on individually guided education in the multiunit elementary school has been sent to nearly 15,000 educators, teacher educators, and state education agency personnel. Another, on Patterns in Arithmetic, was sent to all ETV stations nationally, state mathematics coordinators, and the 300 largest school systems. More recently, a public information document describing the Center's activities was sent to 2,000 superintendents and 8,000 elementary principals. During the past year a large number of articles appeared in professional and scholarly journals. Also, since the Center's initial founding, 80 persons have earned the Ph.D. degree and 18 have earned Master's degrees while working part-time at the Center. In addition, five persons have pursued postdoctoral research at the Center.

The Center is widely represented at scholarly and professional conferences. Center sponsored research has been reported to the American Educational Research Association, Division 15 of the American Psychological Association, and many other national groups. Information about Center products has been disseminated at the annual meetings of the Wisconsin Education Association, the Association for Supervision and Curriculum Development, the National Association of Elementary School Principals, and the National Conference on Elementary Education, in addition to many others.

During the past year the Center sponsored a number of conferences. These were designed primarily for local school district personnel, personnel from teacher education institutions, and for staff members of state education

agencies. Conferences provided the means to disseminate information about Center products, to invite school people to participate in field testing, and to participate in inservice activities related to Center products. Nine major conferences were held about Individually Guided Education in the Multiunit Elementary School, the Wisconsin Design for Reading Skill Development, Individually Guided Motivation, and the creativity training materials. An estimated 1,000 persons from Wisconsin, Michigan, Colorado, Oregon, Iowa, Illinois, Minnesota, Connecticut, New Jersey, Montana, and several other states participated.

The Center's movie, Individually Guided Education for All Children, has been shown nationally and internationally to an estimated 20,000 persons, primarily to educational decision makers, but also to the general public. It continues, one year after release, to be in wide demand.

The Center has received funds for two dissemination projects from the National Center for Educational Communication. One project will focus on the dissemination of information about Patterns in Arithmetic and the other on Individually Guided Education in the Multiunit Elementary School. Information will be sent directly to superintendents, principals, and other educational personnel. Conferences and workshops will follow up the printed information.

The large-scale field testing and installation of Center products continues on an ad hoc, poorly financed basis through the activities of a number of agencies, mostly nonprofit. These agencies have been enumerated in a previous portion of this report. In the fall of 1970 nearly 66,000 children will enroll in schools from coast to coast involved in the field test of Individually Guided Education in the Multiunit Elementary School (see Figure 4). Last year an estimated 385,000 children in 18 states learned elementary mathematics from Patterns in Arithmetic (see Figure 5). Figure 6 shows where approximately 18,500 children will participate in the large-scale field test of the Wisconsin Design for Reading Skill Development.

Technical Development Section

The Technical Development Section facilitates programmatic efforts of the Center by performing services and undertaking activities which complement the research and development activities performed in Programs 1 and 2.

Specifically, the section provides resources and technical and procedural services related to research and development, participates in development of materials intended for teachers and pupils, and undertakes quality verification of such materials. A comprehensive program of school relations is implemented to facilitate materials development and field testing. Following are examples of activities undertaken in 1969-70 in relationship to each of the above-mentioned responsibilities.

With regard to providing resources, specialists in experimental design and statistics, test development, evaluation, and computer applications consult with principal investigators from initial formulation of the problem or task through reporting of the results. In this connection five technical

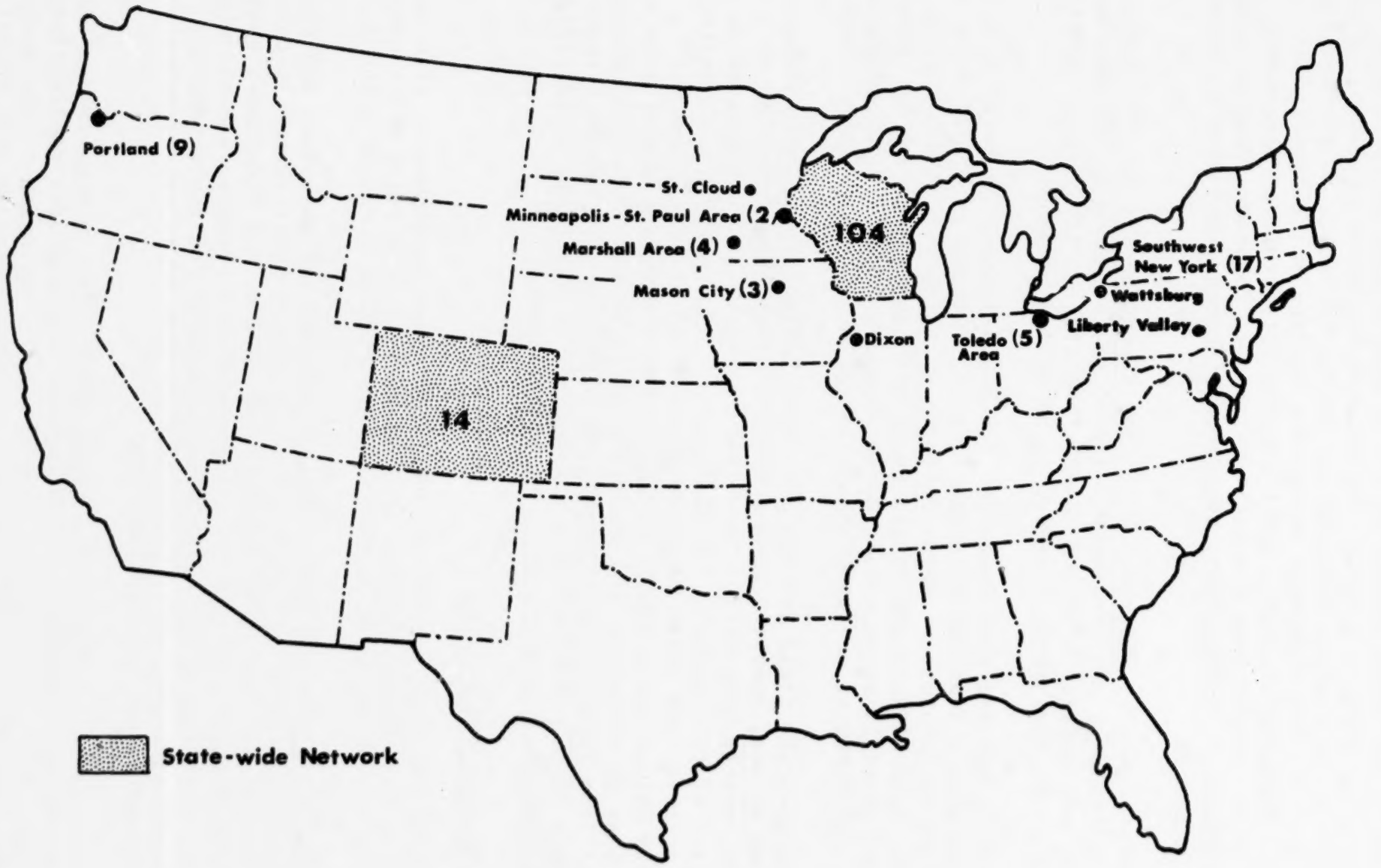

Figure 4

Multiunit Elementary Schools 1970-71

(Estimated 66,000 children & 2,700 teachers)

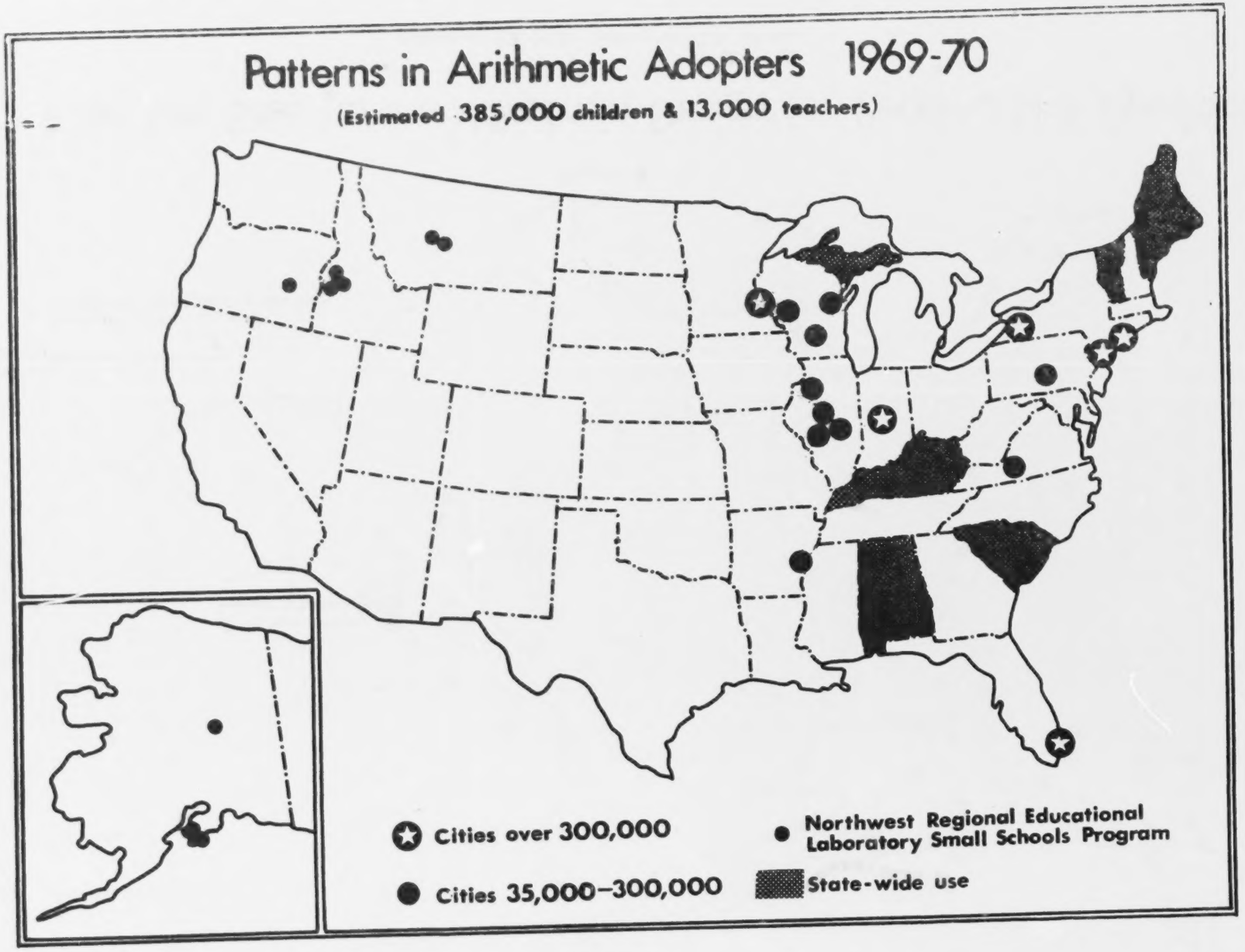
Patterns in Arithmetic Adopters 1969-70
(Estimated 385,000 children & 13,000 teachers)
Cities over 300,000
Cities 35,000–300,000
Northwest Regional Educational Laboratory Small Schools Program
State-wide use

Figure 5

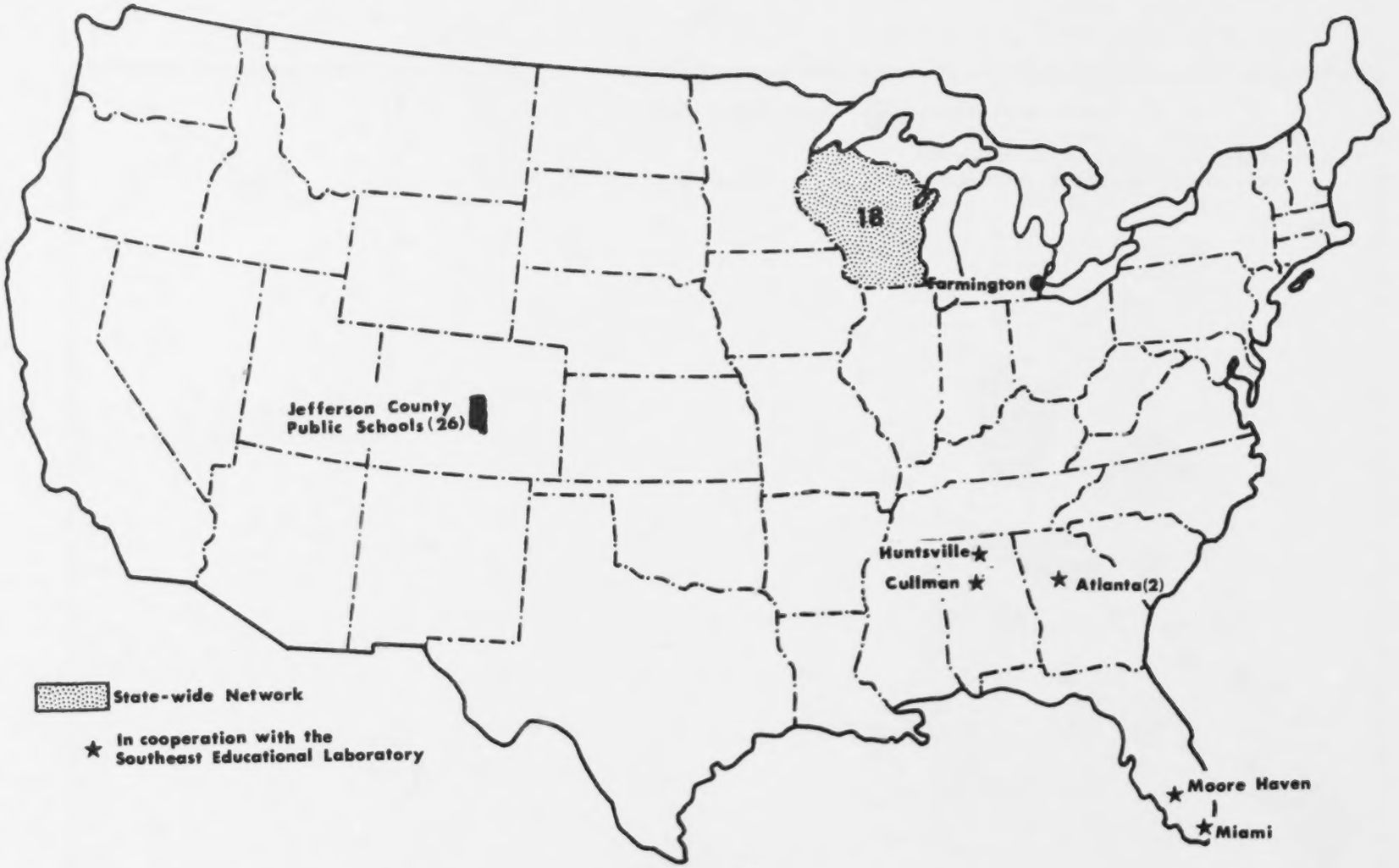

Figure 6

1970-71 Field Test Sites for the Wisconsin Design for Reading Skill Development

(Estimated **18,500** children & **625** teachers)

memos and analysis sections of reports from Projects 102, 103, 104, 111, 204, and 305 have been prepared by Technical Section personnel. The Technical Development Section sponsored eight inservice meetings devoted to technical procedures such as item analysis, and to presentation of information related to Center findings and products. The Research Materials Center maintained an up-to-date collection of books, journals, and other materials relevant to the Center's programmatic thrust. Particular emphasis was placed upon building a collection of tests, both commercial and Center-produced, related to the cognitive and attitudinal development of elementary school children.

The Section also provides technical and procedural services. In this regard the experimental subjects were secured for 97 studies involving 28,000 subjects and the instruments were cleared with the Office of Education. Of the 2,600 subjects who were not elementary school children, 1,200 were elementary school teachers. The Section's cadre of experienced teachers spent approximately 50 man-days in test administration related to the activities of Projects 111 and 204. The Section staff reviewed the content of 46 Center reports prior to publication and conferred with the authors on recommended changes.

In developmental activities program personnel collaborated with project personnel in development of tests, teachers' manuals and other materials for pupils or school personnel. In the past year the first- and second-grade teacher's manuals for PIA have been revised, tried out, and published. Revision of the Grade 3 manual is underway and will be ready for trial use in the schools in the 1970-71 school year. The field test versions of the Wisconsin Tests of Reading Skill Development: Word Attack have been completed in a machine scorable format. A parallel form of the word attack tests has been developed and is ready for quality verification. In addition, the section has worked on the development of the tests associated with Project 111 and has developed ten other instruments in the cognitive and affective domains. The computer-managed systems for reading and mathematics instruction were made fully operational early in the 1969-70 academic year, and were used by the teaching staff in one school to plan individualized programs of study in both subject matter areas. A unique feature of the system is its emphasis on grouping pupils of similar characteristics and needs. This option was used to form ad hoc groups of pupils with common skill deficiencies in reading.

Through participation in the development of tests, including repeated tryout of items and observation of the effect of testing in the school setting, the Section staff assured the technical quality of tests.

In quality verification activities formative evaluations of materials related to reading motivation and creativity were jointly undertaken by the staff of the Technical Development Section and Projects 204, 101, and 103. Summative evaluations for Individually Guided Education, creativity, motivation, reading, and mathematics were planned for the 1970-71 school year, and preliminary training of school personnel and collection of baseline data were undertaken. Specifically the following number of schools in various sites are participating in formal field tests involving use of materials under prescribed conditions:

Product	Number of Schools	Location
Individually Guided Education in the Multiunit Elementary School	75	Wisconsin
Wisconsin Design for Reading Skill Development	30	Wisconsin, Alabama, Georgia, Florida, Colorado
Creativity	9	Wisconsin
Motivation	6	Wisconsin
Patterns in Arithmetic	90	New York, Vermont, Illinois, Oregon, Virginia

Other schools are also invited to make use of the materials without specification of the conditions under which they are used and to thereby participate in a less formal field test. Through survey the section ascertains the effectiveness of materials used in the more natural conditions which will be encountered after large-scale installation.

With regard to school relations, the Technical Development Section coordinates the research and development activities of Projects 101, 201, and 204 in four developmental schools. Center products are piloted in these schools and modifications are made based upon the judgment of the professional staffs of the school and Center. The section sponsored three meetings for the staff of the developmental schools and system consultants, and a statewide planning meeting with 38 schools for the purpose of identifying field test sites.

Operations and Business Section

The Operations and Business Section provides administrative and other services to all elements of the Center. The areas in which the Section operates are personnel, facilities, fiscal matters and legal affairs. The staff is concerned with the acquisition and disbursement of funds, space, equipment, supplies and services and the related accounting and recording operations.

During the past year the staff of the Center has been maintained at nearly full strength. Except in the area of computer technology and related fields, the Center has been able to recruit and employ highly skilled staff for all vacant positions.

Additional space and equipment to provide offices for the staff during the current year has been acquired. In addition, the planning for ESU-1 passed a number of important milestones. Federal funds for the new facility were made available on June 30, 1969. During the year preliminary and final working drawings were prepared and accepted. Bids for construction were received on July 9, 1970, and construction contracts were signed prior to August 9, 1970. The facility is projected for occupancy in September 1972.

Plans to procure special equipment for the building have undergone considerable review during the past year due to the fact that the amount of money available for special equipment was significantly different from the amount requested. A detailed equipment budget, implementation plan, and support budget is in draft form.

An expenditure coding and accounting system developed in 1968 has been revised to be congruent with recent Office of Education budgeting format and the Center's expanded business and operations. The coding of Center expenditures for FY65 and FY66 is complete and for FY67 and FY68 is nearly complete. The initial coding of all fiscal data from prior years will be completed by the end of the current fiscal year. A computer program to summarize the fiscal data is being prepared. Final summary fiscal data for all programs and projects will be completed during the second quarter FY71.

As the Center is increasingly involved with numerous other agencies and schools, it has become necessary to formalize arrangements. For example, in the past year agreements have been signed with agencies and schools to help assure that the reading field test to be conducted next year is conducted appropriately. Agreements with other agencies have assisted the Center in its distribution of products such as Patterns in Arithmetic, Research and Development Toward the Improvement of Education, and the Wisconsin Design for Reading Skill Development. In the past year the Center has begun formalizing arrangements with school districts for field test purposes. These formal arrangements help clarify the responsibilities of the parties involved and are a measure of commitment.

|| Summary and Projections

SUMMARY AND PROJECTIONS

SUMMARY

The Wisconsin Research and Development Center for Cognitive Learning continues its focus on improving educational practices through programmatic research and development. Development efforts are directed toward building the self-renewing system of Individually Guided Education in the Multiunit Elementary School. Research efforts are directed toward understanding cognitive learning in children and related instructional processes, and the results are applied to developing a system of individually guided education. Center efforts are beginning to have an impact on educational practice as its products are adopted by school people; nearly one-half million children are being reached directly by products from the Center. The effects of the Center's publications on research and development in cognitive learning and in teacher education are presumed to be more pervasive.

Highlights of the past year include the further refinement of Individually Guided Education, a design for a self-renewing system of elementary school education in which student literacy is increased and staff self-realization is enhanced. The most advanced components of the design are the trilevel hierarchical organizational pattern called the Multiunit Elementary School, the Wisconsin Design of Reading Skill Development, creative problem solving materials for children to be used in a total language arts program, the system of Individually Guided Motivation, the computer management system for instruction, and video tapes in Patterns in Arithmetic that may be used as audiovisual instructional materials. Less advanced are a second generation of curriculum materials in mathematics, a program of instruction in prereading skills, and a set of supplementary readers in environmental education.

Research and development on learning in the cognitive domain progressed to the point that major effort was devoted to manipulating variables incorporated in printed instructional material and thereby achieving results that may facilitate children's learning through reading and closely related language activities. In this connection the formulation of a system of analyzing concepts, a related schema for testing the level of concept mastery, and an overall model of the strategies and operations involved in concept learning progressed to the point that meaningful instructional materials and tests based on these formulations and developed cooperatively with Program 2 personnel and the Technical Section may be used in both the research of Program 1 and the curriculum projects of Program 2.

In an effort to find the interrelationships between concept attainment in four subject matter areas and cognitive abilities, a research effort involving personnel in Programs 1 and 2 is well under way. Answers are being sought for such questions as "Do certain abilities contribute to the learning of concepts across subject matter areas or are there separate subject matter 'abilities'?" The tests and techniques for this effort have been designed, tried out, and refined. During the next year, the data gathering and analysis will begin.

PROJECTIONS

A few projections are enumerated regarding monetary support, space, personnel, focus, and programs.

Monetary Support, Space, and Personnel, 1969-1973

The Center is now well integrated into the Office of Education R&D program and the University structure. It is a stable organization. Hence, the following seem to be appropriate projections:

° The amount of federal support will increase substantially; very large increases can be utilized effectively through subcontracting to produce prototypic materials and to get their quality verified. The amount of non-federal support will increase markedly but indirectly as profit agencies, mainly publishers, produce and distribute Center outputs as a result of new Office of Education copyright guidelines.

° Little additional space for laboratories or offices will be made available until the new building is occupied in 1972.

° The present staffing pattern of principal investigators, full-time associates and specialists, part-time graduate students, and certified personnel will be continued. Most of the principal investigators, full-time associates and specialists, and certified personnel will be working in the Center in 1973.

Focus and Programs

The focus of the Center as described earlier will continue to guide Center efforts. However, during FY71, a yet sharper focus will be achieved through reducing the number of projects. All programs and curriculum development efforts will focus on the preschool and elementary school years, primarily kindergarten through grade 6. All experiments will be conducted with children of preschool or elementary school age, using potentially meaningful instructional materials, and with independent and stratifying variables directly applicable to the educational setting.

The majority of the total Center effort will be directed toward reading and closely related language arts at the preschool and elementary school level. However, the mathematics projects will not be discontinued so that the substantial investment already made in it is not lost. Further, for lack of federal support, the facilitative environment program, under which Individually Guided Education in the Multiunit Elementary School was initially formulated, was discontinued after FY68. Every effort will be made to fund and staff the program again in FY71.

Appendix A Governing and Advisory Group Membership

GOVERNING AND ADVISORY GROUPS

GOVERNING GROUPS

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Management Council

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Center Director

Thomas A. Romberg, Associate Director
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Mary Quilling
Director of Technical Development Program

James E. Walter
Director of Dissemination

Dan G. Woolpert
Director of Operations and Business

ADVISORY GROUPS

National Evaluation Committee

Dr. Lyle E. Bourne, Jr.
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Yale University (1970)

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Professor of Education
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Dr. Francis S. Chase
Professor, Department of Education
University of Chicago (1971)

Mr. Henry Chauncey
President, Educational Testing Service (1970)

* Chairman
( ) shows completion date of three-year term

National Evaluation Committee (continued)

Dr. Martin Deutsch
Director, Institute for
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Mrs. Elizabeth Koontz, Director
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TASK FORCES

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Wayne Otto
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* Chairman

Appendix B Staff Résumés

STAFF RÉSUMÉS

Principal Investigators

Vernon L. Allen: Professor, psychology; research and publications on social pressure, role theory, and social class; Fullbright scholar in 1968-1969; Ph.D. in social psychology, University of California, Berkeley.

Theodore Czajkowski: Assistant Professor, curriculum and instruction; former acting director, resident intern center for teacher education, Michigan State University; co-author of monograph chapter on research and development resources for classroom teachers; Ed.D. in teacher education, Michigan State University.

Robert Davidson: Associate Professor, educational psychology; research and publications on concept learning; former faculty member, University of California, Berkeley, where he received his Ph.D. in educational psychology.

Gary Davis: Associate Professor, educational psychology; research and publications in creative problem solving; Ph.D. in psychology, University of Wisconsin.

M. Vere DeVault: Professor, curriculum and instruction; author of monographs, articles, textbooks, children's books, current research interest in computer managed mathematics instruction; Ed.D. in elementary education, Indiana University.

Frank Farley: Associate Professor, educational psychology; former research associate in psychiatry at University of Alberta hospital and instructor at the University of Saskatchewan; research and publications on motivation, learning and memory; Ph.D. in psychology, University of London.

Lester Golub: Lecturer, English and curriculum and instruction; former faculty member in English and linguistics at San Jose State University and the University of Nebraska; research and publications on English language and composition; Ph.D. in English education, Stanford University.

John Harvey: Associate Professor, mathematics and curriculum and instruction; former faculty member, the University of Illinois; research and publications on mathematics education; Ph.D. in mathematics, Tulane University.

Herbert J. Klausmeier: V. A. C. Henmon Professor of Educational Psychology and Director, Wisconsin Research and Development Center for Cognitive Learning; former elementary and high school teacher and faculty member at San Francisco and Colorado state colleges; research and publications on educational psychology with emphasis on concept learning; college texts and other scholarly books; Ed.D. in educational psychology, Stanford University.

Donald Lange: Assistant Professor, curriculum and instruction; former faculty member at the University of New Mexico; co-author of monograph chapter on research and development resources for classroom teachers; Ed.D. in curriculum and instruction and pupil personnel services, University of New Mexico.

Joel Levin: Assistant Professor, educational psychology; research and publications on children's learning; Ph.D. in education, University of California, Berkeley.

Wayne Otto: Professor, curriculum and instruction; former faculty member at the Universities of Georgia and Oregon; author of articles and textbooks on reading; Ph.D. in education, University of Wisconsin.

Milton Pella: Professor, curriculum and instruction; has taught elementary and high school science and published numerous articles and workbooks; research in science education; Ph.D. in science education, University of Wisconsin.

Thomas Romberg: Associate Professor, curriculum and instruction and mathematics; and Associate Director, Wisconsin Research and Development Center for Cognitive Learning; publications and research on mathematics education; Ph.D. in mathematics education, Stanford University.

B. Robert Tabachnick: Professor and Chairman, Department of Curriculum and Instruction; research and publications on elementary teaching in American and African cultures; Ed.D. from Stanford University.

Richard Venezky: Associate Professor of English and of Computer Science; Ph.D. in linguistics, Stanford University; systems programmer and technical writer for Control Data Corporation, consultant on reading and spelling for Science Research Associates; consultant on linguistic programs for Educational Development Corporation; published a college text, several articles; research in language concepts.

Alan Voelker: Assistant Professor, curriculum and instruction; former faculty member and coordinator of experimental program for teacher education at Ohio State University; research and publications on science education; Ph.D. in science education, University of Wisconsin.

Larry Wilder: Assistant Professor, speech; research and publications on the relationship between speech, behavior, and problem-solving in young children; Ph.D. in speech, Pennsylvania State University.

Peter Wolff: Assistant Professor, educational psychology; research and publications on cognitive processes in autistic children and on perception; current research interest is perceptual development; Ph.D. in developmental psychology, University of Michigan.

Scientists

James Moser, Associate Scientist, mathematics education; formerly associate professor of mathematics education, University of Colorado; research and publications on geometry for elementary children and teachers and for high school students; Ph.D. in mathematics education, University of Colorado.

Research Associates

Eunice Askov: Project 204; B.A. in English, Denison University. M.A. in English, University of Wisconsin; Ph. D. in curriculum and instruction with emphasis on reading, University of Wisconsin.

Robin Chapman: Project 104; B.A. in psychology, Swarthmore College. Ph.D. psychology, University of California, Berkeley.

Dorothy Frayer: Project 101; B.A. in chemistry and M.A. in counseling, Michigan State University; Ph.D. in educational psychology, University of Wisconsin.

Wayne Fredrick: Project 204; B.S. in secondary education, University of Wisconsin; M.S. in educational psychology, University of Wisconsin; Ph.D. in educational psychology, University of Wisconsin.

Margaret Harris: Technical development; specialist in factor analysis and measurement theory; B.S. in health and physical education, Pennsylvania State University; M.S. in physical education, University of Wisconsin; Ph.D. in physical education, University of Wisconsin; former high school teacher and University of Wisconsin faculty member.

Herbert Walberg: Technical development; specialist in evaluation; former faculty member and evaluator of Project Physics, Harvard University; B.Ed., Chicago State College; M.Ed., University of Northern Illinois; Ph.D. in educational psychology, University of Chicago.

Directors

Mary Quilling: Technical Development Section; author of articles and papers; elementary teacher for six years; M.S., Wisconsin State University, Oshkosh.

James Walter: Dissemination Section; former teacher and educational consultant for Michigan Department of Education; M.Ed., University of Oregon.

Dan Woolpert: Operations and Business Section; former elementary and high school teacher; M.S., University of Wisconsin.

Coordinators

Anne Buchanan: field test manager, Patterns in Arithmetic; former elementary teacher and unit leader; M.S. in curriculum and instruction, University of Wisconsin.

Robert Rude: field test manager, Wisconsin Design for Reading Skill Development; former classroom teacher, remedial reading instructor and reading consultant; M.S. in teaching, Wisconsin State University-Eau Claire.

Juanita Sorenson: field test manager, Individually Guided Education in the Multiunit Elementary School; eleven years' experience as high school teacher in Wisconsin; M.S. in entomology, University of Wisconsin; anticipates Ph.D. in curriculum and instruction.

Alice Weck: production coordinator and writer, Dissemination Section; former high school teacher; M.S. in journalism, University of Wisconsin; course work completed for Ph.D. in educational policy studies.

Project Specialists

Thomas Fischbach: statistician, Technical Development Section; formerly with the Wisconsin Board of Health and the University of Wisconsin; M.S. in statistics, University of Wisconsin.

Evelyn Hoekenga: assistant to director, Operations and Business Section; former high school teacher; B.A., Wheaton College.

Susan Houtman: specialist with Project 103; former faculty and staff member, Hope College, Holland, Michigan; M.S. in educational psychology, University of Wisconsin.

Mike Irwin: writer, Dissemination Section; former high school teacher and newspaper reporter and editor; M.A. in education journalism, University of Wisconsin.

Karolyn Kamm: specialist in elementary reading with Project 204; former elementary school teacher; M.S. in education, University of Wisconsin.

Vera Meyer: graphic artist, Dissemination Section; former teaching assistant in cartography; B.A., University of Wisconsin.

Pamela Miles: specialist, Technical Development Section; former project specialist with University of Wisconsin department of psychology and elementary teacher in New York; B.A., Utica College, Syracuse University.

Joyce Mills: research materials specialist; former school librarian; Master's degree in library science, University of Wisconsin.

Barbara Myhre: specialist in basic pre-reading skills with Project 104; formerly worked with the University department of English; M.A. in English, University of Wisconsin.

Barbara Nelson: specialist, Project 102; M.A. in psychology, Illinois State University; former instructor in psychology, Wisconsin State University-Stevens Point.

Nancy Nelson: specialist with Project 111; former high school teacher; B.A. in psychology, Grinnell College.

Karen Nielsen: graphic artist, Dissemination Section; three years' experience in commercial art; has taught junior high school; B.S. in applied art and teacher certification from the University of Wisconsin.

Margaret Patterson: editor, Dissemination Section; media experience as newspaper reporter and publisher and radio and television copy chief; working toward degree in journalism, University of Wisconsin.

Jean Steitz: specialist with Project 111; formerly with United Aircraft Research and with the Space Science and Engineering Center at the University; B.A., University of Wisconsin.

Joanne Strike: specialist, Technical Development Section; former elementary school teacher; M.A., Northwestern University.

Deborah Stewart: specialist in technical development; former assistant editor in Educational Test Department, Science Research Associates; M.S. in educational psychology, University of Wisconsin.

Jane Traupmann: specialist with Project 101; M.S. in psychology, University of Wisconsin-Milwaukee.

Evelyn Weible: specialist for Project 111: former librarian for public libraries of Madison and New York City and for universities of Iowa and Wisconsin; Masters' degree in librarianship, University of Washington, and curriculum and instruction, University of Wisconsin.

Joan Westley: specialist, Technical Development Section; B.A. in psychology, University of Wisconsin.

Virginia Wilkinson: specialist, Technical Development Section; formerly with educational Testing Service; B.A., Ohio Wesleyan University.

Appendix C

Selected Bibliographies

Results of Center activities are reported in nearly 275 publications: technical reports, theoretical papers, practical papers, working papers, and scholarly books. The publications listed in this appendix are representative of the focus of each program. A complete bibliography is available from the Center. Also included is a selected bibliography of works by Center researchers on Center-related themes which have been published outside the Center.

SELECTED CENTER PUBLICATIONS

PROGRAM 1: CONDITIONS AND PROCESSES OF LEARNING

Klausmeier, Herbert J., & Harris, Chester W. (Eds.) Analyses of concept learning. New York: Academic Press, 1966. 272 pp.

Frayer, Dorothy A., Fredrick, Wayne C., & Klausmeier, Herbert J. A schema for testing the level of concept mastery. Working Paper No. 16. 1969. 32 pp.

Klausmeier, Herbert J., Schwenn, Elizabeth A., & Lamal, Peter A. A system of individually guided motivation. Practical Paper No. 9. 1969. 40 pp.

Klausmeier, Herbert J., Sterrett, Barbara E., Frayer, Dorothy A., Lewis, Susan B., Lee, Vincent W., & Bavry, James L. Concept learning: a bibliography, 1950-1967. Technical Report No. 82. 1969. 178 pp.

Sorenson, Juanita S., Schwenn, Elizabeth A., & Klausmeier, Herbert J. The individual conference--a motivational device for increasing independent reading in the elementary grades. Practical Paper No. 8. 1969. 54 pp.

Klausmeier, Herbert J., Sterrett, Barbara E., Robinson, Pamela E., Frayer, Dorothy A., & Bavry, James L. A supplement to Technical Report No. 82, Concept learning: a bibliography, 1968. Technical Report No. 107. 1969. 69 pp.

Klausmeier, Herbert J., Robinson, Pamela E., Frayer, Dorothy A., & DeVault, Margaret. A supplement to Technical Report No. 82, Concept learning: a bibliography, January-June 1969. Technical Report No. 120. 1970. 48 pp.

Davidson, Robert E. A research program in the semantic components of concept learning. Working Paper No. 25. 1969. 20 pp.

Davidson, Robert E. The effects of deep structure variations in sentences: free recall and paired-associate learning. Technical Report No. 110. 1969. 11 pp.

Klausmeier, Herbert J., & Frayer, Dorothy A. Cognitive operations in concept learning. Working Paper No. 36. 1970. 45 pp.

Farley, Frank H. Memory storage in free learning as a function of arousal and time with homogeneous and heterogeneous lists. Technical Report No. 87. 1969. 8 pp.

Haveman, Jacqueline E., & Farley, Frank H. Arousal and retention in paired-associate, serial, and free learning. Technical Report No. 91. 1969. 18 pp.

Farley, Frank H., & Severson, Herbert H. The stability of individual differences in "strength" and "sensitivity" of the nervous system. Working Paper No. 34. 1970. 18 pp.

Berkowitz, Gloria. Individual differences in the orientating responses as related to reading readiness and early linguistic skills. Technical Report. In preparation.

Manske, Mary E., & Farley, Frank H. Individual differences in the orienting response and arousal as factors in the short- and long-term retention of children in grades K-4. Technical Report. In preparation.

Kumar, V. K., & Farley, Frank H. Influence of temperal parameters and intensity of post-learning arousal change on long-term retention. Technical Report. In preparation.

Farley, Frank H., & Manske, Mary. The relationship of individual differences in the orienting response to complex learning in kindergartners. Technical Report No. 132. 1970. 18 pp.

Thinking creatively: a guide to training imagination. 1968. 152 pp.

Write? Right! In preparation.

Saturday subway ride. (Creativity Workbook.) In preparation.

Davis, Gary A., Houtman, Susan E., Warren, Thomas F., & Roweton, William E. A program for training creative thinking: I. preliminary field test. Technical Report No. 104. 1969. 18 pp.

Davis, Gary A., Manske, Mary E., & Train, Alice J. Training creative thinking. Occasional Paper No. 6. 1967. 20 pp. Reprinted as Occasional Paper No. 1, Creative Education Foundation, Buffalo, New York. 1967.

Roweton, William E. Creativity: a review of theory and research. Theoretical Paper No. 24. 1970. In preparation. 28 pp.

Freiheit, Susan C. The effects of a training program upon the creative performance of fourth grade children. Technical Report No. 79. 1969. 114 pp.

Davis, Gary A., Roweton, William E., Train, Alice J., Warren, Thomas F., & Houtman, Susan E. Laboratory studies of creative thinking techniques: the checklist and morphological synthesis methods. Technical Report No. 94. 1969. 24 pp.

Calfee, Robert C., & Venezky, Richard L. Component skills in beginning reading. Technical Report No. 60. 1968. 14 pp.

Calfee, Robert C., Chapman, Robin S., & Venezky, Richard L. How a child needs to think to learn to read. Technical Report. In preparation.

Venezky, Richard L., Calfee, Robert C., & Chapman, Robin S. Skills required for learning to read: a preliminary analysis. Working Paper No. 10. 1968. 18 pp.

Calfee, Robert C., Venezky, Richard L., & Chapman, Robin S. Pronounciation of synthetic words with predictable and unpredictable letter-sound correspondence. Technical Report No. 71. 1969. 15 pp.

Rudegeair, Robert E., & Kamil, Michael L. Assessment of phonological discrimination in children. Technical Report No. 118. 1970. 17 pp.

Levin, J. R., & Horvitz, J. M. Verbal and visual processes in children's learning: I. meaning in paired-associate learning. Working Paper. In preparation.

Allen, Vernon L., & Levine, John M. Social support and conformity: the effect of differentiation from the group and order of responding. Technical Report No. 72. 1969. 8 pp.

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